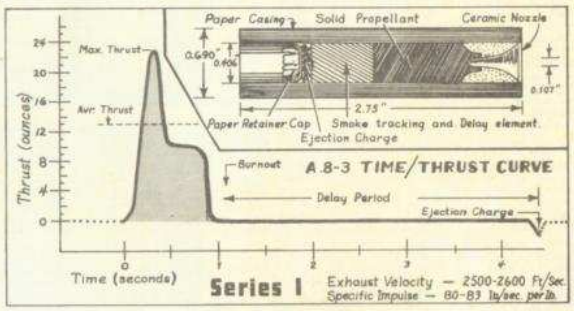
The 1964 Estes Catalog

ROCKET ENGINE DESIGN

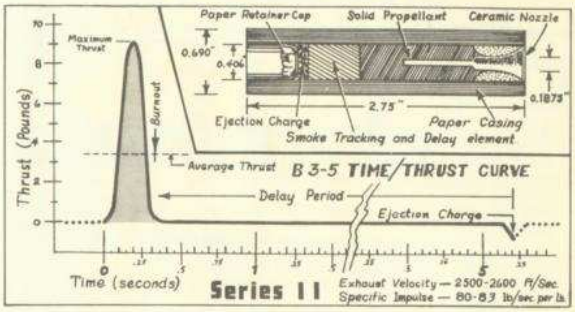
This rocket engine design and performance information is given for educational purposes only. We believe that if you understand how your rocket engine works you are in a better position to gain scientific knowledge from your activities and to design your rockets for specific purposes such as payload experimentation, altitude studies, drag racing, etc. We DO NOT grant permission for you to attempt to copy our design nor do we recommend that you attempt to build your own rocket engines.

The Series I engine is a solid propellant type with a dual thrust level design. There is a slight center bore at the very tip of the nozzle end of the grain which serves two purposes. First, it provides for easy ignition. Second, as you will note from the Series I graph, this special design produces a high initial thrust of 23 oz., thus stabilizing your rocket more quickly. This is because the slight center bore provides a relatively large burning area, resulting in faster consumption of the fuel. After this initial high thrust, a transition to



an end burning grain is made, and the thrust drops to a sustaining level of 10 oz. Data from wind tunnel tests show this dual thrust level to be the most effective design for rocket engines which are used to propel lightweight model rockets at sub-sonic speeds.

The slow burning delay and tracking charge is ignited at the burnout of the propellant grain. This slow burning, smoke producing charge provides no thrust, but permits the rocket to coast upward to its peak altitude. At the burnout of the delay charge a recovery system ejection charge is ignited which pressurizes the forward end of the rocket body tube, activating



the recovery system. For further information, see the Series I performance graph and cutaway drawing.

The Series II engine is a solid propellant type with a center burning grain. This provides a greater propellant burning area, resulting in a higher thrust level than the Series I engines, but with a shorter thrust duration. The total thrust duration of a Series II engine is slightly under .35 sec. This makes the thrust characteristics of the engine somewhat like a sledge hammer blow--thrust rises to over 9 pounds in a fraction of a second, then drops off again, as shown in the Series II performance graph. The average thrust of the Series II engine is 3.4 pounds. The result is that the Series II engine is ideal for acceleration studies, as a booster on heavy multi-stage rockets, and for drag racing. Delay charge and ejection charge operation are the same in the Series I and Series II engines.

Making Rocket Engines

At our plant rocket engines are made automatically, under controlled conditions, with limited amounts of propellant being measured by explosion proof metering devices. If you wish to attempt to build your own engines "safely," we would recommend that you have in reserve a few thousand dollars in cash for special equipment, a college degree, a safe place to work (not in a garage or basement), protective clothing and some specialized training. If you build rocket engines with less than the above you may find as some chemistry teachers, students, and many others have, that through the rest of your life you will be without a finger, hand, arm, eye, ear, face, or you may well be badly burned or even killed. Our country needs live rocket scientists and engineers who have all their fingers and hands. We are looking forward to fellows like you to fulfill this need.

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